

FIRST FIVE YEAR REVIEW REPORT

FOR

SUMMITVILLE MINE SUPERFUND SITE
SUMMITVILLE, RIO GRAND COUNTY, COLORADO

Final Report

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-Signed-
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August 3, 2000

Five-Year Review Report

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List of Acronyms

AMD	Acid Mine Drainage
ARARs	Applicable or Relevant and Appropriate Requirements
CPPHE	Colorado Department of Public Health and the Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
GPM	Gallons Per Minute
HASP	Health and Safety Plan
HLP	Heap Leach Pad
MCLs	Maximum Contaminant Levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Units
RALs	Risk Action Levels
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SCMCI	Summitville Consolidated Mining Company, Inc.
SSC	Superfund State Contract

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): Summitville Mine Superfund Site		
EPA ID (from WasteLAN): COD983778432		
Region: 8	State: CO	City/County: Summitville / Rio Grande
SITE STATUS		
NPL status: <input checked="" type="checkbox"/> Final <input type="checkbox"/> Deleted <input type="checkbox"/> Other (specify) _____		
Remediation status (choose all that apply): <input checked="" type="checkbox"/> Under Construction <input type="checkbox"/> Operating <input type="checkbox"/> Complete		
Multiple OUs?* <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Construction completion date: ____ / ____ / ____	
Has site been put into reuse? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
REVIEW STATUS		
Reviewing agency: <input checked="" type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency _____		
Author name: Victor Ketellapper		
Author title: Remedial Project Manager	Author affiliation: USEPA	
Review period:** 3 / 1 / 2000 to 8 / 2 / 2000		
Date(s) of site inspection: None		
Type of review:*** <input checked="" type="checkbox"/> Statutory <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div><input type="checkbox"/> Policy</div> <div> <input type="checkbox"/> Post-SARA <input type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal only <input type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional Discretion) </div> </div>		
Review number: <input checked="" type="checkbox"/> 1 (first) <input type="checkbox"/> 2 (second) <input type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify) _____		
Triggering action:**** <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Actual RA Onsite Construction at OU # ____ <input type="checkbox"/> Construction Completion <input type="checkbox"/> Other (specify) _____ </div> <div> <input checked="" type="checkbox"/> Actual RA Start at OU# <u>0</u> <input type="checkbox"/> Previous Five-Year Review Report </div> </div>		
Triggering action date (from WasteLAN): 6 / 7 / 1995		
Due date (five years after triggering action date): 6 / 7 / 2000		

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the five-year review in WasteLAN.]

*** [see page A-18 and Chapter 1 for further explanation.]

**** [see page A-19 and Chapter 1 for further explanation.]

Five-Year Review Summary Form

Deficiencies:

Although water quality in the Alamosa River downstream of the Summitville Mine has significantly improved since the implementation of emergency response and interim remedial actions, aquatic life in the Alamosa River is not currently protected. The Site-Wide RI/FS will evaluate alternatives for achieving this goal.

The Beaver Mud Dump contains seeps and several slump block type earth movement which have become a debris flow down-slope toward the SDI.

It appears that the water within the Heap Leach Pad may be in contact with the local groundwater table. If this is true, the water within the Heap Leach Pad is likely to chemically evolve. The Site-Wide RI/FS needs to consider how water will evolve and the potential of it becoming a source of acid mine drainage.

The Summitville Dam Impoundment was designed as a temporary structure. The Site-Wide RI/FS should evaluate if this structure is to be part of the remedy. If the Summitville Dam Impoundment is to be included in the Site-Wide remedy, then it will need to be upgraded to pass the Colorado State Engineers minimum requirements of the 100-year flood.

The adits will require rehabilitation and regular maintenance for continued safe access. This work is planned to be performed this summer and in the future, as needed.

Recommendations and Follow-up Actions:

All of the concerns identified including the development of a remedy protective of the environment shall be evaluated in the Site-wide Remedial Investigation and Feasibility Study. All proposed additions or changes to the operations or remedies at the Summitville Mine will be included in the Proposed Plan and subject to public comment. The Site-wide Remedial Investigation and Feasibility Study is scheduled to be completed by September 2001.

Protectiveness Statement(s):

Metals concentrations have decreased significantly and pH values have increased in the Alamosa River downstream of its confluence with the Wightman Fork as the implementation of the interim response actions at the Site has progressed. However, the Summitville Mine remains as a dominate contributor of copper, zinc, and cadmium to the Alamosa River Watershed. The aquatic water quality standards in the Alamosa River have not yet been achieved. Aquatic life has not been completely restored in the impacted areas of the Alamosa River. It is anticipated that additional remedial actions may be necessary to achieve the water quality standards and restore aquatic life in the Alamosa River. Any additional remedial actions will be evaluated in the Site-Wide Remedial Investigation and Feasibility Study.

Other Comments:

Five-Year Review Report

I. Introduction

The United States Environmental Protection Agency (EPA) Region VIII has conducted a five-year review of the interim remedial actions being implemented at the Summitville Mine Superfund Site in Summitville, Colorado. This review was conducted from February 2000 through June 2000. This report documents the results of the review.

The purpose of this five-year review is to determine whether the interim remedies, once completed at the Summitville Mine, are expected to be protective of human health and the environment. In addition, the five-year review identifies any deficiencies in the interim remedies found during the review and provides recommendations to address them. The methods, findings, and conclusions of the reviews are documented in this report.

A Site-Wide Remedial Investigation/Feasibility Study (RI/FS) is currently being completed at the Summitville Mine and is scheduled to be completed in 2001. The purpose of the RI/FS is to determine if any further remedial actions are necessary for the protection of human health and the environment. It will include a detailed analysis of the success of the interim remedial actions and provide the basis for any additional remedial actions. Thus, this five-year review, provides a general overview of the status of the implementation of the Interim Remedial Actions and determine if these remedies are expected to be protective of human health and the environment.

This review is required by statute. The EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c), as amended, states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first five-year review for the Summitville Mine Superfund Site. The triggering action of this statutory review is the date of the start of construction of the Interim Remedial Actions which was June 7, 1995, the start of construction of the Water Treatment Interim Remedial Action.

II. Site Chronology

The Site has been segregated into five operable units as listed below:

1. Operable Unit 00 - Water Treatment
- Operable Unit 01 - Heap Leach Pad
- Operable Unit 02 - Cropsy Waste Pile, Beaver Mud Dump/ Summitville Dam Impoundment and Mine Pits
- Operable Unit 03 - Groundwater
- Operable Unit 04 - Reclamation

The chronology of events at the Site is shown in Table 1.

III. Background

The Summitville Mine is an abandoned gold mine located about 25 miles southwest of Del Norte, Colorado. It is located within the San Juan Mountain Range of the Rocky Mountains, in the Rio Grande National Forest, approximately 2 miles east of the Continental Divide, at an average elevation of 11,500 feet. Water flows from the mine via Cropsy Creek and Wightman Fork into the Alamosa River, approximately 5 miles below the mine.

The permitted 1,231 acre Summitville Mine contains approximately 550 acres of disturbed area, most of which is positioned on the northeastern flank of South Mountain. The Wightman Fork and the ghost town of Summitville bound this site to the north, Cropsy Creek to the south, and the mine workings of the South Mountain “highwall” to the southwest.

The Summitville area experiences long, cold winters, and short, cool summers. Protected snow banks on northern aspect slopes can persist throughout the year. Thunderstorms are common in the afternoon hours during the months May through September and can be very intense and short in duration. Many of the northern aspect slopes and most of the lower slopes are heavily covered with spruce and interspersed with stands of aspens at the lower elevations of the mine. The upper slopes consist of a tundra ecosystem.

Table 1 - Chronology of Site Events

Operable Unit	Event	Start	Complete
	Site Discovery		11/27/91
	Removal Action	12/16/92	12/15/94
	NPL Listing		5/31/94
0	RI/FS	5/11/93	12/15/94
0	Interim Record of Decision Signed		12/15/94
0	Remedial Design	9/16/94	3/20/97
0	Remedial Action	6/7/95	9/16/99
0	Final RI/FS	5/11/93	ongoing
0	Long Term Response Action	9/16/99	ongoing
1	Interim Record of Decision Signed		12/15/94
1	Remedial Design Start	1/1/96	5/3/96
1	Remedial Action - Phase I	6/7/95	9/16/99
1	Remedial Action - Phase II	7/11/96	ongoing
2	Feasibility Study	6/2/94	12/15/94
2	Interim Record of Decision Signed		12/15/94
2	Remedial Design	9/16/94	3/24/95
2	Remedial Action	6/7/95	9/16/99
4	Feasibility Study	6/2/94	12/15/94
4	Interim Record of Decision Signed		12/15/94
4	Remedial Design	3/15/96	12/31/98
4	Remedial Action	10/1/98	ongoing

History

Gold was first discovered at Summitville in 1870. In 1903, the Reynolds adit was driven to drain the underground mine workings and serve as an ore haulage tunnel. Production of gold occurred

sporadically through the 1950s. In the 1970s, the Summitville Mine was evaluated as a copper mine. However, copper mining was not pursued.

During the 1980s, new technologies for extracting metals from low-grade ore were being developed. One new technology used cyanide heap leach techniques for extracting gold from low-grade ores. The process began by mining large volumes of low-grade gold ore. The crushed ore was then placed on an impermeable liner forming a heap leach pad. Cyanide solutions were then sprinkled onto the heap and allowed to trickle down through the crushed ore, dissolving gold. The solutions were then collected from the base of the heap leach pad and the gold was chemically extracted.

In 1984, the Summitville Consolidated Mining Company, Inc. (SCMCI), initiated mining gold at the Site using the cyanide heap leaching process. Open pit mining extracted the gold ore from the area surrounding the historic underground workings, where gold concentrations had been too low to be economically feasible for underground mining operations. Acidity and metal contaminants increased significantly in the Wightman Fork of the Alamosa River as a result of the drainage from these new mining operations. Figure 1 presents a map of the features of the mine resulting from this phase of mining.

On December 4, 1992, SCMCI filed for bankruptcy and provided notice to the State of Colorado that after December 15, 1992, operations required to prevent the discharge of heavy metals and cyanide from the Summitville Mine would cease. To prevent this discharge from occurring, the EPA began an emergency response action on December 16, 1992. The Site was listed on the NPL on May 31, 1994.

To stabilize the mine site, the EPA signed four Interim Record of Decisions on December 15, 1994. These interim Records of Decision address the following four operable units (OUs) at the mine: Water Treatment (OU-00), Heap Leach Pad (OU-01), Cropsy Waste Pile, Beaver Mud Dump/Summitville Dam Impoundment and Mine Pits (OU-2), and Mine Reclamation (OU-04). The work outlined in these Interim Remedial Actions has been completed or has been contracted to be completed. A decision for Groundwater (OU-03), was deferred until EPA had a chance to investigate the effectiveness of the Removal Actions completed.

Currently, the interim remedial actions and a Site-Wide Remedial Investigation/Feasibility Study (RI/FS) are being completed at the Summitville Mine. The Site-Wide RI/FS is evaluating the effectiveness of the interim remedial actions and identifying and proposing any further remedial actions that may be necessary to achieve water quality objectives in the Alamosa River.

Contaminants

The quality of drainage waters from the Summitville Mine generally have a pH below 3.5 and high concentrations of iron, aluminum, copper, zinc and other metals. This poor quality water is a result of mining, which exposed large volumes of waste rock to weathering. Sulfide minerals,

contained within the waste rock, react with oxygen and water to form sulfuric acid. The acidic solution dissolves the metals found in the waste rock, resulting in an acid metal-laden solution known as acid mine drainage (AMD).

Additional acid mine drainage was formed as a result of the development of the Mine Pits during SCMCI's operation. The Mine Pits formed a depression that collected precipitation and funneled it into the former underground mine workings. The addition of water from the Mine Pits significantly increased the volume of acid mine drainage released from the Reynolds adit, the lowest drainage tunnel in the underground portion of the mine. During the period of SCMCI's operation, the acid mine drainage was, for the most part, released from the Summitville Mine untreated to the environment. AMD continues to be generated at the Site, requiring five-year reviews to be conducted.

Land and Resource Uses

The environmental problems at Summitville have been of particular concern due to the extensive use of the Alamosa River water for wildlife habitat, livestock, and irrigation of agricultural lands in southwest portions of the San Luis Valley. The increased acid and metal loading from the Summitville Mine into the Alamosa River watershed have caused the destruction of all aquatic life for more than 17 miles downstream of the mine, including at the Terrace Reservoir. There are concerns that the contamination released from the mine may have impacted wetlands that are habitat for aquatic life and migratory waterfowl such as ducks and the endangered whooping crane. Water from the Alamosa River is used extensively to irrigate crops and for livestock. Important crops and livestock include alfalfa, barley, wheat, sheep and cattle.

Mining, timber harvesting, and grazing have been the chief historical uses associated with the Summitville area. Future land uses are unknown and dependent on the property owners. Potential future land use includes ecological, grazing, mining and tourism.

REMEDIAL ACTIONS

On December 15, 1994, four Interim Record of Decisions (IRODs) were issued for the Summitville Mine Superfund Site (the Site). The four IRODs were prepared for the following areas:

- Operable Unit 00 - Water Treatment
- Operable Unit 01 - Heap Leach Pad
- Operable Unit 02 - Cropsy Waste Pile, Beaver Mud Dump/Summitville Dam Impoundment and Mine Pits
- Operable Unit 04 - Reclamation

The work was segregated into four IRODs to better manage this large project, with each IROD addressing a different aspect or media of the Site. The remedies were designed to work together to reduce the toxicity to aquatic life resulting from the release of AMD from the Summitville Mine. The interim remedy for OU-00, Water Treatment, provides for water treatment of surface water runoff to reduce the volume of acid mine drainage released from the Site. The remaining IRODs conduct actions aimed at reducing the generation of AMD.

The overall Remedial Action Objectives for the IRODs were:

1. Reduce or eliminate deleterious water flow from the Summitville Mine into the Wightman Fork.
2. Reduce or eliminate the need for continued expenditures in water treatment for the Summitville Mine.
3. Reduce or eliminated the acid mine drainage from the man-made sources on the Summitville Mine.
4. Reduce or eliminate any human health or adverse environmental effects from mining operations downstream from the Summitville Mine, including in the Alamosa River.
5. Encourage early action and acceleration of the Superfund process.

The four interim remedial actions were selected to address some or all of these Remedial Action Objectives. The remainder of this section discusses the work completed and the current status of these interim remedial actions.

Operable Unit 00 – Water Treatment

Water treatment was initiated on an emergency basis when the mining company that operated the facility, the Summitville Consolidated Mining Company, Inc. (SCMCI), declared bankruptcy and abandoned the Site in early December 1992. On December 18, 1992, the EPA issued an Action Memorandum, documenting the need for water treatment as a time critical removal action.

The Interim Record of Decision for Operable Unit 00, provides for treatment and storage of acid mine drainage generated from the Summitville Mine, while other measures designed to prevent the formation of acid mine drainage were being implemented concurrently. This section summarizes the activities that have occurred to implement the water treatment IROD and documents the success EPA has had in meeting the remedial action objectives of this IROD. A memorandum documenting minor changes to this interim remedy was signed on May 16, 1997 by the Remedial Project Manager. The components of the selected remedy as modified have been implemented and are operational. The following is a description of each component of the

selected remedy (underlined) and how it was implemented.

- Continued treatment of the Cropsy Waste Pile drainage and the French Drain waters in the Cropsy Water Treatment Plant. Treatment of the drainage from the Cropsy Waste Pile was discontinued after the waste pile had been removed and placed into the Mine Pits. To facilitate the construction of the Heap Leach Pad cap, the Cropsy Water Treatment Plant was taken out of service and removed. Water from the French Drain under the Heap Leach Pad was directed via pipe line to the Summitville Dam Impoundment. The Summitville Dam Impoundment is a containment reservoir used to collect water draining from the Site prior to treatment.
- Destruction of cyanide in the water from the Heap Leach Pad will continue in the Cyanide Destruction Plant/Metals Removal Plant until the water quality meets remedial action objectives. Cyanide concentrations within the Heap Leach Pad were reduced, achieving the remedial action objectives established for the Heap Leach Pad Interim Remedial Action. The cyanide destruction process has been discontinued.
- Completion of Heap Leach Pad remediation, followed by the conversion of the Cyanide Destruction Plant to treat acid mine drainage, would allow the Metals Removal Plant to be closed. The Metals Removal Plant would remain on-site as a contingency facility. The cyanide destruction portion of the Heap Leach Pad interim remedy has been completed. Due to the Metals Removal Plant's proximity to Summitville Dam Impoundment, it was decided to modify the Metals Removal Plant to treat acid mine drainage rather than use the facility housed at the Cyanide Destruction Plant. The Metals Removal Plant has been modified to treat acid mine drainage.
- Containment of Acid Mine Drainage in the area of the Summitville Dam Impoundment/Beaver Mud Dump Area during peak surface water flows that exceed the water treatment capacity of 500 gallons per minute. The contained water would be treated before being released into the Wightman Fork. The Summitville Dam Impoundment, a 90 million-gallon storage reservoir for acid mine drainage, was constructed by the removal of mining waste from the Beaver Mud Dump and by raising a historic tailings pond dam located adjacent to the Beaver Mud Dump. During the winter months, the acid mine drainage is collected and stored in the Summitville Dam Impoundment. Collecting and storing this water allows the Site to be closed during the winter months, resulting in significant cost savings. The water treatment capacity at the Site was also reevaluated. The results of this reevaluation demonstrated that the treatment capacity of 500 gallons per minute described in the Interim Record of Decision was insufficient. The capacity of the water treatment facility in the Metals Removal Plant was optimized, resulting in a capacity of approximately 1,000 gallons per minute. However, the combination of storage and treatment capacities is not sufficient to manage peak flows during most spring runoff periods. Since reclamation of the mine was underway pursuant to a companion IROD and is expected to reduce the amount of water treatment needed,

additional treatment or storage capacity was not constructed. Rather, the Site would be operated during spring runoff such that the water with the highest concentration of metals would be directed into the Summitville Dam Impoundment. The water of the best quality would be released from the Site during spring runoff. During spring runoff, water may be released from the Summitville Dam Impoundment untreated. The volume of water required for treatment will be reduced in the near term as mine reclamation is completed. At that time, the existing water storage and treatment capacity may be sufficient. This issue is to be evaluated in the Site-Wide Feasibility Study.

All components of the modified interim remedy as outlined in the Interim Record of Decision and the memorandum documenting minor changes to the remedy have been constructed. The facilities have operated consistently and effectively during the past year. The facilities are operational and functional.

Operable Unit 01 – Heap Leach Pad

Emergency response actions were initiated at the Heap Leach Pad after the mining company that operated the facility, the Summitville Consolidated Mining Company, Inc.(SCMCI), declared bankruptcy and abandoned the Site in early December 1992. On December 18, 1992, EPA issued an Action Memorandum, documenting the need for cyanide removal and to control the elevation of water contaminated with cyanide and heavy metals in the Heap Leach Pad as a time critical removal action. On December 15, 1994, an interim Record of Decision was signed to complete closure of the Heap Leach Pad.

The major components of the selected interim remedy was completed in two phases, as described below:

- Phase I - Destruction of cyanide contained within the Heap Leach Pad using in-situ biological treatment methods.
- Phase II - Recontouring, capping and vegetating the Heap Leach Pad to reduce the volume of water entering the Heap Leach Pad.

The remainder of this section discusses the status of the implementation of the two phases of the interim remedy for the HLP.

Phase 1

Construction activities consisted of pumping and treating leachate contaminated with cyanide and heavy metals from the Heap Leach Pad. The treatment of the leachate began as a Removal Action in December 1992. Initially, the treated water was discharged to the Wrightman Fork. After the water level in the Heap Leach Pad was reduced, clean water was applied to the Heap Leach Pad to rinse the cyanide that had adhered to the ore. Cyanide was removed from the

leachate by injecting a 70 percent hydrogen peroxide solution into leachate as it was pumped to the water treatment plant. After the cyanide was destroyed by hydrogen peroxide, the leachate was further treated to remove metals using a precipitation process.

From August 21 through September 25, 1995, 30 holes were drilled into the Heap Leach Pad to collect data on the effectiveness of the cyanide rinsing efforts and to collect data needed for design of the biotreatment process. Water and soil samples were collected from this drilling effort. The samples were analyzed for cyanide and heavy metals.

Results from the sampling demonstrated that the concentration of cyanide had been significantly reduced by the "clean rinse" program. Based on the reduced concentrations of cyanide in the Heap Leach Pad, the human health and environmental risk associated with an untreated release of water containing cyanide was reevaluated. The evaluation found that "the release of further untreated cyanide for the Heap Leach Pad would not cause a health hazard or an unacceptable risk to any receptors (per EPA Superfund risk criteria)." Thus, biotreatment for the removal of cyanide with the Heap Leach Pad was no longer required. An Explanation of Significant Differences memorandum to the IROD was prepared to document this change to the interim remedy. The Explanation of Significant Differences memorandum was approved by EPA Region VIII's Assistant Regional Administrator on June 4, 1997.

All components of Phase I of the interim remedy as outlined in the IROD as modified have been completed. The remedial action objective of reducing cyanide levels within the Heap Leach Pad to the point it no longer poses a threat to human health and the environment has been achieved.

Phase II

The capping of the HLP occurred over two construction seasons, beginning in 1997 and ending in late 1998. To allow for proper installation of the cap, the HLP was regraded from an irregular "dog bone" shape to a dome shape. The side slopes of the HLP were regraded to 5:1 (horizontal to vertical) and the top slopes were graded to 20:1. Approximately 75,000 cubic yards of water treatment plant sludge, that had been disposed of around the southern and eastern perimeter of the HLP, was excavated, stabilized with lime, disposed of in the well can area of the HLP. Approximately 850,000 cubic yards of waste rock material from adjacent areas and 350,000 cubic yards of HLP material was used to regrade the pad prior to placement of the cap.

The cap consisted of a geocomposite drain sandwiched between two layers of geosynthetic clay liner (GCL). The geocomposite drain was constructed of a synthetic drain net that had geotextile thermally bonded at the factory to both sides. GCL is constructed of sodium bentonite (approximately 1 pound per square foot) stitched between two layers of geotextile material. Three tiers of anchor trenches were installed on the 5:1 slopes to secure the liner system to these steeper slopes. The design of this cap system has a predicted infiltration rate of 0.2 inches per year.

The liner material was covered by a four-foot thick thermal protection layer of HLP material and six inches of amended topsoil. The thermal protection layer material consists of finer grained spent ore material that was set aside during HLP regrading. To facilitate root penetration under the topsoil, the subgrade was amended with crushed limestone at a rate of 30 tons per acre and mushroom compost at a rate of 40 tons per acre. The topsoil was amended with lime at a rate of 30 tons per acre to neutralize the soil, facilitating plant germination and growth.

Precipitation on the surface of the HLP is captured in the ditch and drain system installed on the perimeter of the HLP. This system is located on the inside of the road located on the perimeter of the HLP. The perimeter drain consists of a perforated pipe installed in gravel, which discharges into the 550 ditch.

To prevent surface water from running onto the HLP, the Cropsy Drain was constructed. The Cropsy drain is located to the East of the HLP. The drain consists of one 54-inch pipeline placed in gravel bedding.

An outfall, located at an elevation of 10 feet below the HLP Dike No. 1 crest, was installed to prevent the HLP from overtopping. The outfall drain consists of two four-inch high-density polyethylene (HDPE) pipes imbedded in a sand and gravel layer. The two four-inch pipes tie into a single, four-inch HDPE pipe that breaches the HLP liner in the Northwest Quadrant of the HLP. The outfall pipeline then runs parallel to the 54-inch Cropsy drain pipeline, day-lighting adjacent to the 54-inch Cropsy drain pipeline outfall.

A filter drainage layer was constructed to collect seepage and to improve the stability of Dike 1 of the HLP. Dike 1 of the HLP is the downstream retaining structure across the lower end of the Cropsy Valley. The Dike 1 material was excavated from the toe and replaced with a sand filter to collect seepage and compacted fill to add stability to Dike 1. During this construction, the french drain sump was removed and replaced with a HDPE pipeline. This pipeline directs flow from the french drain under the HLP to the Summitville Dam Impoundment.

During the final construction inspection, a punch list of items required to complete the interim remedy was prepared. It was determined to complete this work under a separate contract. This list includes improvements to the perimeter ditch and road, reclamation of Dike 1, removal of sediments and reclamation of the 550 Ditch. This work is scheduled to be completed in 2000.

Operable Unit 02 - Cropsy Waste Pile, Beaver Mud Dam/Summitville Dam Impoundment and Mine Pits

This section discusses the implementation of the Interim Remedial Action for Operable Unit 02 (OU-02), the Cropsy Waste Pile, Beaver Mud Dump/Summitville Dam Impoundment and Mine Pits. This work was started on October 1, 1993 as a non-time critical removal action to quickly control the generation and release of acidic metal-laden water known as acid mine drainage. In

December 1994, an Interim Record of Decision was signed for this action, transferring this action to an Interim Remedial Action.

The purpose of the interim remedy was to reduce or eliminate the generation of acid mine drainage from the Cropsy Waste Pile, Summitville Dam Impoundment, the Beaver Mud Dump, and the Mine Pits. The interim remedy was selected to eliminate or reduce the generation of acid mine drainage by isolating hazardous substances and inhibiting their contact with water and/or oxygen necessary to produce acid mine drainage. The major components of the interim remedy selected and constructed to achieve this goal are as follows:

1. The removal of mining waste in the Cropsy Waste Pile and the Beaver Mud Dump that had covered naturally occurring surface seeps. This seep water would no longer flow through mine waste, reducing the volume of acid mine drainage generated.
2. Excavation of acid-generating tailings and sediments from the Summitville Dam Impoundment. The impoundment's water would no longer flow through mine waste, reducing the volume of acid mine drainage generated.
3. Placement and capping of material excavated from the Cropsy Waste Pile, Beaver Mud Dump and Summitville Dam Impoundment into the Mine Pits. In addition to providing a place for the excavated material, this action would decrease the infiltration of ground water into the underground mine workings via the Mine Pits. The volume of acid mine drainage generated in the former underground mine would therefore be reduced.
4. Placement of an acid neutralizing material on the base of the Mine Pits prior to placement of excavated material. This material would neutralize acid mine drainage formed during placement of the mine waste into the Mine Pits.

The construction of the interim remedy for the Cropsy Waste Pile, Beaver Mud Dump, and the Mine Pits has been completed. The remaining portion of this section provides a summary of the construction activities conducted to complete this interim remedy. Due to the short construction season at the Summitville Mine, the construction of the interim remedy for OU-2 was segregated into three phases. The first two phases were completed as a non-time critical removal action, while the final phase was completed as an interim remedial action. Each phase represented one construction season. Work not completed in an earlier phase was completed in the next phase. Each phase of construction was completed under a different contract.

Phase I

The first phase of construction began on October 1, 1993. During this phase of construction, a liner was placed on the bottom of the Mine Pits and waste material was excavated from the Cropsy Waste Pile and placed into the Mine Pits.

The first activity completed was the removal of the topsoil on the Cropsy Waste Pile. This topsoil was stockpiled adjacent to the Cropsy Waste Pile for use in the future. Approximately 72,000 cubic yards of topsoil was removed.

Next, a layer of clay was removed from the Cropsy Waste Pile. This clay material was used to construct the liner at the base of the Mine Pits. The clay liner in the bottom of the Mine Pits was placed to a finished thickness of three feet. Clay was placed against the pit walls to produce a continuous liner with the liner on the bottom of the pits. In the South Pit, the liner was extended up the pit walls 60 feet. In the North Pit, the liner was extended up the pit walls 40 feet. Approximately 76,000 cubic yards of clay liner was placed in the Mine Pits.

A five-foot layer of acid neutralizing material, lime kiln dust, was placed on the bottom of the Mine Pits. Approximately 1,800 tons of lime kiln dust was placed in the Mine Pits.

Once the clay liner and lime kiln dust was placed into the Mine Pits, mine waste from the Cropsy Waste Pile was placed into the mine pits. Approximately 927,000 cubic yards of mine waste was removed from the Cropsy Waste Pile and placed in the Mine Pits. The work was stopped for the season on February 12, 1994.

Phase II

During this phase of the construction, approximately 2,670,000 cubic yards of mine waste rock was excavated from the Cropsy Waste Pile and 350,000 cubic yards of material was removed from the Beaver Mud Dump. This material was placed into the Mine Pits. Fine-grained material was placed around the inside perimeter of the Mine Pits. This material was spread in lifts of 2 feet deep and 20 feet wide. The material was compacted with six passes of a sheeps-foot compactor.

Once the perimeter area was built up in elevation by 5 feet, the mining wastes were placed into the center of the pit. Waste was placed in the pits and spread in five foot lifts. This area was compacted by routing loaded haul trucks over the entire area. Once the lift was completed, the next section of the compacted perimeter area was constructed. This method was used until all the excavated material had been placed in the Mine Pits.

Phase III

During this phase of construction, the Summitville Dam was modified and material was removed from the Beaver Mud Dump, Cropsy Waste Pile and the Clay Fines Stockpile.

The Summitville Dam was modified by raising the height of the dam, constructing a new spillway, constructing outlet works in the old spillway, and improving the structure to withstand a 25-year storm event. The dam was stabilized by installation of a gravel drain, sand filter, and additional earth fill. The sand and gravel materials were from an off-site source. The approximately 56,000

cubic yards of earth fill was from material removed from the Beaver Mud Dump. Once completed, an 90 million-gallon reservoir to store surface water runoff from the mine was created.

Approximately 960,000 cubic yards of material was removed from the Beaver Mud Dump. This material was placed in the Mine Pits and used as earth fill for the Summitville Dam modifications. Approximately 25,000 cubic yards of topsoil was salvaged from this excavation.

The South Pit was capped with a geosynthetic clay liner (GCL). GCL is a product constructed of bentonite clay stitched between two layers of geosynthetic fabric. GCL is used to reduce infiltration of water. A 4-foot thick layer of material from the Clay Fines Stockpile was placed over the GCL for thermal protection.

The North Pit was graded and sloped such that surface water would drain away from the Mine Pits area. A cap constructed using an onsite source of clay, was placed on the North Pit. Additional, mining waste will be moved and placed in the North Pit during construction of the interim remedy for Operable Unit 04, Site-Wide reclamation.

Operable Unit 04 - Reclamation

The design of the remedy for OU-4 has been completed. The following design criteria were developed to meet the project objectives.

Grading: Grading will be performed to reduce steep soil or fill embankments to 3:1 (horizontal to vertical) or flatter, and depressions will be filled to minimize infiltration of water. Mine waste materials will be removed from the natural drainage-ways and wet areas to reduce acid generation. Rock cuts will be filled to a 3:1 slope where possible; the exception being the highwall.

Roads: Permanent roads on the Site were identified as necessary to maintain access to key areas. These areas are the CDP building, Cropsy Waste Pile area, North Waste Dump, Chandler Adit, and the top of South Mountain. The maximum design grade is 15 percent and the minimum radius for horizontal curves is 250 feet.

Site Drainage Control: Surface water is to be conveyed by a system of ditches sized to pass the 100-year storm event, based on criteria used by the State Division of Minerals and Geology. Ditch construction is dependent upon water velocity. Ditches exposed to water velocities below 4.5 feet/second will be grass lined. Ditches designed for water velocities between 4.5 and 10 feet/second will be a combination of grass and flexible channel liner. Above 10 feet/second, the ditches will be riprap lined.

Revegetation: Subsoils in the disturbed areas are to be amended with limestone and mushroom compost. Mushroom compost is to be applied at a rate of 40 tons/acre and the limestone is applied at variable rates, depending upon soil tests. The amendments are to be incorporated to a

depth of 12 inches and covered with an additional 6 inches of limestone amended topsoil prior to seeding. Approximately 300 acres will be revegetated.

The construction of the interim remedy for OU-4 is scheduled to be completed in 2002. Work completed in the 1999 construction season included excavation, re-contouring, and revegetation of the areas above and below the Heap Leach Pad in the Cropsy Valley, a portion of the North Waste Dump, the Missionary Seeps area and the Water Treatment Plant area.

Operation and Maintenance

Due to the interdependence of several interim remedial actions being conducted at the Mine and the interim nature of the RODs, Operation and Maintenance issues were not addressed. A Site-Wide ROD is planned to be completed in the year 2001. The Site-Wide ROD will address operation and maintenance requirements to assure the performance of the final Site-Wide remedy.

V. Five-Year Review Process

This five-year review is being completed while construction of the interim remedies is not yet completed and while a Site-Wide Remedial Investigation/Feasibility Study (RI/FS) is in progress. The RI/FS is evaluating in detail how the interim remedies are functioning and what additional actions, if any, are necessary to protect human health and the environment. Thus, this five-year review is narrower in scope than one for a site where final remedial action decisions and construction of the remedies have been completed.

The five-year review was prepared by EPA, based on a review of relevant data and documents. These data and documents included the Interim Record of Decisions, Remedial Action Reports, the Draft Tier II Ecological Risk Assessment, and the Draft Site-Wide Remedial Investigation/Feasibility Study. A complete list of references is found in Section XII. The draft report was reviewed by EPA, the Colorado Department of Public Health and the Environment (CDPHE), and the Summitville Technical Assistance Group (TAG).

VI. Five-Year Review Findings

Environmental studies concerning the Summitville Mine are ongoing. Major contaminant sources have been addressed through a series of response actions. However, all of the interim remedial actions have not yet been completed. The response actions completed have resulted in reductions of contaminant into the Alamosa River Watershed from the Summitville Mine. However, the remedial action objectives established for this Site have not yet been met. This five-year review has identified several issues that have not been fully addressed by the interim actions including, surface water quality, operation of adit plugs, stability of earthen structures, and operation and maintenance. These issues will be fully addressed in the Site-Wide ROD. A brief description of each of these issues and statement from the Summitville TAG is found in the remainder of this section.

Surface Water Quality

Metals concentrations downstream of the Site at sampling location WF-5.5 have decreased significantly. Figure 2 shows the decline of metals concentrations plotted with a time line of the environmental response actions take at the mine.

Metals concentrations have decreased significantly and pH values have increased in the Alamosa River downstream of the confluence with the Wightman Fork as the implementation of the response actions at the Site. However, the Summitville Mine remains as a dominant contributor of copper, zinc, and cadmium to the Alamosa River Watershed. The aquatic water quality standards in the Alamosa River have not yet been achieved.

The water treatment plant operates from May 1 to October 31 of each year. When the treatment plant is not operating, contaminated water is stored in the Summitville Dam Impoundment (SDI). Water contained within the SDI is treated prior to release. However, during spring run off, the combination of water treatment and storage capacity is generally insufficient to prevent a release of untreated water from the Mine. It is anticipated that once construction of the interim remedies is completed, the need for water treatment will be reduced.

Adit Plugs

The Reynolds and Chandler Adits were plugged as a non-time critical removal action in 1993 to flood the underground mine workings. The purpose of flooding the mine workings is to inhibit the generation of Acid Mine Drainage from the sulfide materials remaining in and around the underground mine. The flow has significantly reduced from the Reynolds Adit. However, the effectiveness of the plugs is uncertain since flows from springs and seeps around the Site has appeared to have increased. Also, the role of the adit plugs in the Site-Wide remedy has not yet been determined. The role of the adit plugs in the Site-Wide remedy will be determined in the Site-Wide ROD. Alternatives being considered include using the plugs to maintain a certain water level in the underground mine, as well as removal of the plugs.

Stability of Earthen Structures

Stability of several earthen structures were evaluated as part of the ongoing Remedial Investigation. The Beaver Mud Dump, the Heap Leach Pad Dike No. 1, the North Waste Dump and Highwall were found to potentially have stability problems. There are several small slope failures appearing on the north facing BMD slope. Stabilization of this slope is to be addressed in the Site-Wide RI/FS.

Analysis of the HLP Dike 1 indicates that the slope is stable. However, past monitoring of the inclinometers has indicated some minor movement. These inclinometers were destroyed during the reclamation of Dike 1. They will be replaced in 2000. Continued monitoring of this structure

is required to evaluate stability. Removal of water from the HLP should be considered as one method for stabilizing Dike 1.

A review of the slope stability analysis of the North Waste Dump indicated that the North Waste Dump is marginally stable. This analysis was based on assumptions of the properties of the materials within the Dump. Sampling will occur in 2000 to provide data to perform a more accurate assessment of the stability of the North Waste Dump.

Rockfalls have been observed on the Highwall and it is expected to continue to deteriorate. The effect of this deterioration on water quality, ditch carrying capacity, and the revegetation of mine pit caps will need to be evaluated through monitoring.

Human Health and Environmental Risk

The primary risk resulting from the release of acid mine drainage from the Summitville Mine is to the aquatic ecosystem. These risks are decreasing as a result of EPA's emergency and interim response actions. Aquatic risks downstream of the Site remain above levels necessary for the survival of aquatic life. Community members have reported the return of fish, salamanders and benthic macro-invertebrates in the previously impacted areas furthest downstream of the mine.

Drinking water wells located in close proximity to the Alamosa River were sampled in 1999. These results found that Site contaminants have not migrated from the surface water to the groundwater drinking water wells.

Operation and Maintenance

Operation and Maintenance needed was not outlined in the Interim RODs. Any Operation and Maintenance requirements needed to assure the selected Site-Wide remedy meets remedial action objectives will be determined and selected in the Site-Wide ROD and Remedial Design.

Community Statement on Status of Superfund Actions

The following statement was prepared by the Summitville Technical Assistance Group. This statement reflects the concerns of the community regarding the clean-up activities at the Summitville Mine.

The Summitville TAG, overall, is very pleased with the efforts that have been put into this project. As the years have passed on this project, it is apparent that efficiency in performance has increased considerably. We have also become very aware of the complexity of a project this size and location.

There are three areas of consideration, at this time, that the TAG Group wants to remain as priorities when considering the successful outcome of this Superfund site. They are as follows:

- 1. We feel the Reynolds Tunnel Adit plug needs to be removed and not considered as part of the remedy. If it continues to be considered as a viable solution to the remedy, then serious work needs to be done on the tunnel, plug and valves to assure stability. Also continued studies to assure the safety of such a decision. If storage and release from this location is deemed necessary, then the Adit needs to be equipped to meet this demand.*
- 2. We were very alarmed this spring upon hearing about the amount of water and the traces of cyanide in the Heap Leach Pad. Although the State of Colorado assured us that we had been informed of this prior to the announcement at one of our meetings on the RIFS, this information had gone un-noticed by our group. The community was somewhat alarmed and once again fear and untruths followed. The TAG would like to be able to assure the community without hesitation, that the Heap Leach Pad will be of “no” risk to the watershed and that the stability of the dike is not an issue.*
- 3. Water treatment to meet the needs of this site is imperative. This should be done with an awareness of the monumental amounts of precipitation that this site can receive.*

Finally, we would like you to consider the aforementioned items in the degree of “risk” that the impacted community sees rather than a scientific observation conceived of formulas and statistics. This community and watershed cannot survive another oversight.

VII. Assessment

- Question A: Is the remedy functioning as intended by the decision documents?

The effectiveness of the revegetation efforts and drainage ditches on the reduction of acid generation will be seen with time. Continued water sampling will be required at points on the site and downstream of the Site to determine the impact of the mine reclamation. Water quality has significantly improved, yet aquatic life has not been completely restored in impacted areas of the Alamosa River. Also, continued monitoring of the earthen structures and cut slopes at the Site will be required to determine the effect of surface stabilization efforts. The Site-Wide remedy and remedial design will address any possible short coming of the interim RODs

- Question B: Are the assumptions used at the time of remedy selection still valid?

A complete reevaluation of the assumptions used at the time of the selection of the interim remedies will be completed as part of the Site-Wide Remedial Investigation and Feasibility Study.

- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

This review has found that the interim remedies being implemented at the Summitville Mine Superfund Site may not be completely protective of the environment. This will be evaluated in the Site-Wide remedial Investigation/Feasibility Study. Any further remedial action necessary to protect the environment will be included in the Site-Wide proposed plan and ROD.

VIII. Deficiencies

Although water quality in the Alamosa River downstream of the Summitville Mine has significantly improved since the implementation of emergency response and interim remedial actions, aquatic life in the Alamosa River is not currently protected. The Site-Wide RI/FS will evaluate alternatives for achieving this goal.

The Beaver Mud Dump contains seeps and several slump block type earth movement which have become a debris flow down-slope toward the SDI.

It appears that the water within the Heap Leach Pad may be in contact with the local groundwater table. If this is true, the water within the Heap Leach Pad is likely to chemically evolve. The Site-Wide RI/FS needs to consider how water will evolve and the potential of it becoming a source of acid mine drainage.

The Summitville Dam Impoundment was designed as a temporary structure. The Site-Wide RI/FS should evaluate if this structure is to be part of the remedy. If the Summitville Dam Impoundment is to be included in the Site-Wide remedy, then it will need to be upgraded to pass the Colorado State Engineers minimum requirements of the 100-year flood.

The adits will require rehabilitation and regular maintenance for continued safe access. This work is planned to be performed this summer and in the future, as needed.

IX. Recommendations and Follow-up Actions

All of the concerns identified in this five-year review shall be evaluated in the Site-wide Remedial Investigation and Feasibility Study. All proposed additions or changes to the operations or remedies at the Summitville Mine will be included in the Proposed Plan and subject to public comment. The Site-wide Remedial Investigation and Feasibility Study is scheduled to be completed by September 2001.

X. Protectiveness Statement(s)

Metals concentrations have decreased significantly and pH values have increased in the Alamosa River downstream of its confluence with the Wightman Fork as the implementation of the interim response actions at the Site has progressed. However, the Summitville Mine remains as a dominate contributor of copper, zinc, and cadmium to the Alamosa River Watershed. The aquatic water quality standards in the Alamosa River have not yet been achieved. Aquatic life has not been completely restored in the impacted areas of the Alamosa River. It is anticipated that additional remedial actions may be necessary to achieve the water quality standards and restore aquatic life in the Alamosa River. Any additional remedial actions will be evaluated in the Site-Wide Remedial Investigation and Feasibility Study.

XI. Next Review

This Site requires ongoing five-year reviews to occur by statute. The next five-year review is scheduled to be completed by June 30, 2005.

XII. References

CDM Federal Programs Corporation, Draft Report, Tier II Ecological Risk Assessment Addendum for Summitville Mine Superfund Site, November 1999.

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U.S. Environmental Protection Agency, Interim Record of Decision for Cropsy Waste Pile, Cleveland Cliffs Tailing Pond, Beaver Mud Dump, and Mine Pits, Summitville Mine Superfund Site, Summitville, Colorado, December 15, 1994.

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U.S. Environmental Protection Agency, Interim Record of Decision for Reclamation, Summitville Mine Superfund Site, Summitville, Colorado, December 15, 1994.